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# LINKING THE FIFTH PILLAR TO THE FIRST IN THE UN DECADE OF ACTION

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## ABSTRACT

The UN Decade of Action outlines five pillars of activity within a safe system framework to achieve the goal of slowing and then reversing the global growth in road traffic fatalities, especially in low-income and middle-income countries. The first four pillars - road safety management, safer roads and mobility, safer vehicles, and safer road users – have a strong focus on prevention of road traffic crashes and mitigation of energy exchange when a crash occurs. The fifth pillar – post-crash response – is far more specific, focusing only on crash victims in the event of a safe system failure. The victims appear to be relevant to the first four pillars only insofar as their numbers can be used to evaluate the success of road safety programs and identify the target groups and contributing factors. This paper argues that a better understanding of the lived experience of long term disability from traffic crashes has the potential to provide a feedback loop from the fifth pillar to the first. Research conducted in Thailand with male crash victims with spinal injury demonstrates that patterns of attribution and social and cultural factors have important implications for road safety management and for interventions aimed at influencing behaviour. In addition, the mobility constraints experienced by people with long term disability can point to systemic issues that might otherwise go unnoticed. The UN Decade of Action can benefit from a more thorough exploration of the experiences and circumstances of people with long term disability as the result of a road traffic crash. Rather than being evidence of the failure of the safe system, they can inform the development of more effective road safety management on low-income and middle-income countries.

## 1 INTRODUCTION

In May 2011 the UN released its Global Plan for the Decade of Action for Road Safety (WHO, 2011). The purpose of the Plan can be paraphrased as follows (p. 3):

- It provides the rationale for the declaration of the Decade of Action by the UN;
- It is intended to “facilitate coordinated and concerted action”; and
- It provides “a framework to allow coordinated activities at the global level” while at the same time being intended as “a tool to support the development of national and local plans of action”.

The Plan is intended to contribute to achieving the goal of the Decade of Action, which is stated as “stabilizing and then reducing the forecasted level of road traffic fatalities around the world by increasing activities conducted at national, regional and global levels” (p. 7). Given that the estimated annual toll is 1.3 million people killed and up to 50 million injured, this is a significant public health undertaking. Consistent with a public health approach, the main emphasis of the Plan is on prevention of road crashes, with limited attention to post-crash factors. In this paper we argue that the achievement of safer roads and traffic in low-income and middle-income countries would be enhanced by investigating the longer term consequences of road crashes and feeding this information back.

## 2 FIVE PILLARS SAFE SYSTEM FRAMEWORK

The Plan takes a “safe system” approach that views road crashes as being inevitable because human error will always occur, but sees road use as taking place in a system whose features can be designed or changed to minimize the incidence of human error and the consequences of a crash when it does occur. The consequences of the crash are often expressed in terms of energy exchange, since it is the exchange of energy in a crash that determines the level of injury. The intention is to manipulate the parameters of the system to reduce both the incidence of crashes (by eliminating the “system failure” aspects as much as possible) and the energy exchanged in the crash.

The Global Plan conceptualises the safe system as structured around five “pillars”:

- Road safety management
- Safer roads and mobility
- Safer vehicles
- Safer road users
- Post-crash response

The document depicts them in a kind of sequence (Figure 1), with Pillar 1 being the overarching road safety management structures and operations that should make the system safe (legislation, data systems, budgets, agencies), Pillars 2, 3 and 4 describing the standard categories of factors contributing to crashes (roads, vehicles and road users), and Pillar 5 dealing with the response once a crash has occurred (ambulance, immediate treatment).

<b>Pillar 1</b> <b>Road safety management</b>	<b>Pillar 2</b> <b>Safer roads and mobility</b>	<b>Pillar 3</b> <b>Safer vehicles</b>	<b>Pillar 4</b> <b>Safer road users</b>	<b>Pillar 5</b> <b>Post-crash response</b>
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Figure 1: The five pillars of the Global Plan safe system (Source: WHO, 2011)

These five pillars are not universal. The Australian safe system framework (ATC, 2011) features only four elements: Safe Roads, Safe Speeds, Safe Vehicles and Safe People. The Cambodia National Road Safety Action Plan includes the five pillars above and adds three more: law enforcement, vulnerable road users and driving licenses (Pen, 2010; see RCVIS, 2011 for a different version). However the five pillars in the Global Plan draw significance from their role in shaping the policies, plans and activities of countries around the world.

## 3 THE FIFTH PILLAR AND ITS RELATION TO THE FIRST FOUR

The first four Pillars have a strong focus on prevention of road traffic crashes and mitigation of energy exchange when a crash occurs. They are aimed at broad changes – influencing road safety management across all road safety domains, making all road infrastructure more

conducive to safe travel, improving crashworthiness of all vehicles, improving behaviour of all road users. This is consistent with a public health approach, which focuses on prevention first and foremost, then on mitigation. Prevention approaches in road safety deal with all road users, who are all potentially at risk of being involved in a crash. The aim is to reduce the probability that a crash will occur by addressing risk factors such as behaviour (speeding, drink driving), road conditions (slippery surface, lack of road shoulders, poor visibility) and vehicle factors (brake maintenance, stability). Mitigation approaches deal with the subset of road users in the process of experiencing a crash, in order to reduce the probability of injury and/or the likely severity of injury. They usually address road factors (clearance of roadside obstacles, guardrails, frangible poles) or vehicle factors (airbags, ESC, restraints) though behavioural factors are involved as well (restraint use, helmet wearing).

<b>Pillar 5: Post crash response</b>
Increase responsiveness to post-crash emergencies and improve the ability of health and other systems to provide appropriate emergency treatment and longer term rehabilitation for crash victims.
<p><u>Activity 1:</u> Develop prehospital care systems, including the extraction of a victim from a vehicle after a crash, and implementation of a single nationwide telephone number for emergencies, through the implementation of existing good practices.</p> <p><u>Activity 2:</u> Develop hospital trauma care systems and evaluate the quality of care through the implementation of good practices on trauma care systems and quality assurance.</p> <p><u>Activity 3:</u> Provide early rehabilitation and support to injured patients and those bereaved by road traffic crashes, to minimize both physical and psychological trauma.</p> <p><u>Activity 4:</u> Encourage the establishment of appropriate road user insurance schemes to finance rehabilitation services for crash victims through:</p> <ul style="list-style-type: none"> <li>▪ Introduction of mandatory third-party liability; and</li> <li>▪ International mutual recognition of insurance, e.g. green card system.</li> </ul> <p><u>Activity 5:</u> Encourage a thorough investigation into the crash and the application of an effective legal response to road deaths and injuries and therefore encourage fair settlements and justice for the bereaved and injuries.</p> <p><u>Activity 6:</u> Provide encouragement and incentives for employers to hire and retain people with disabilities.</p> <p><u>Activity 7:</u> Encourage research and development into improving post crash response.</p>

Figure 2: National level activities for post-crash response (Pillar 5) recommended in the Global Plan (Source: WHO, 2011)

The fifth pillar – post-crash response – appears in contrast to be far more specific, focusing only on crash victims in the event of a safe system failure: the crash has occurred, and the mitigating factors during the crash have played their role. Figure 2 presents the excerpt in the Global Plan recommending national level activities for post-crash response, while Figure 3 (next page) presents the excerpt dealing with the first pillar – road safety management.

Pillar 1: Road safety management
<p>Encourage the creation of multi-sectoral partnerships and designation of lead agencies with the capacity to develop and lead the delivery of national road safety strategies, plans and targets, underpinned by the data collection and evidential research to assess countermeasure design and monitor implementation and effectiveness.</p>
<p><u>Activity 1:</u> Establish a lead agency (and associated coordination mechanisms) on road safety involving partners from a range of sectors through:</p> <ul style="list-style-type: none"> <li>• designating a lead agency and establishing related secretariat;</li> <li>• encouraging the establishment of coordination groups; and</li> <li>• developing core work programmes.</li> </ul> <p><u>Activity 2:</u> Develop a national strategy (at a cabinet or ministerial level) coordinated by the lead agency through:</p> <ul style="list-style-type: none"> <li>• confirming long-term investment priorities;</li> <li>• specifying agency responsibilities and accountabilities for development and implementation of core work programmes;</li> <li>• identifying implementation projects;</li> <li>• building partnership coalitions;</li> <li>• promoting road safety management initiatives such as the new ISO traffic safety management standard ISO 39001; and</li> <li>• establishing and maintaining the data collection systems necessary to provide baseline data and monitor progress in reducing road traffic injuries and fatalities and other important indicators such as cost, etc.</li> </ul> <p><u>Activity 3:</u> Set realistic and long-term targets for national activities based on the analysis of national traffic crash data through:</p> <ul style="list-style-type: none"> <li>• identifying areas for performance improvements; and</li> <li>• estimating potential performance gains.</li> </ul> <p><u>Activity 4:</u> Work to ensure that funding is sufficient for activities to be implemented through:</p> <ul style="list-style-type: none"> <li>• building business cases for sustained funding based on the costs and benefits of proven investment performance;</li> <li>• recommending core annual and medium-term budgetary targets;</li> <li>• encouraging the establishment of procedures for the efficient and effective allocation of resources across safety programs;</li> <li>• utilizing 10% of infrastructure investments for road safety; and</li> <li>• identifying and implementing innovative funding mechanisms.</li> </ul> <p><u>Activity 5:</u> Establish and support data systems for on-going monitoring and evaluation to include a number of process and outcome measures, including:</p> <ul style="list-style-type: none"> <li>• establishing and supporting national and local systems to measure and monitor road traffic deaths, injuries and crashes;</li> <li>• establishing and supporting national and local systems to measure and monitor intermediate outcomes, such as average speed, helmet-wearing rates, seat-belt wearing rates, etc.;</li> <li>• establishing and supporting national and local systems to measure and monitor outputs of road safety interventions;</li> <li>• establishing and supporting national and local systems to measure and monitor the economic impact of road traffic injuries; and</li> <li>• establishing and supporting national and local systems to measure and monitor exposure to road traffic injuries.</li> </ul>

Figure 3: National level activities for road safety management (Pillar 1) recommended in the Global Plan (Source: WHO, 2011)

The brief description of post-crash response activities at the top of Figure 2 mentions both “emergency treatment and longer term rehabilitation”. Most of the activities listed deal with emergency response and immediate post-crash care, as might be expected. The two activities that deal indirectly with longer term disability concern the establishment of financial support for rehabilitation and creation of job opportunities.

There is a subtle but important issue here: the investigation of the crash is mentioned in terms of legal proceedings and settlements, and appears to be a necessary form of feedback into Activity 5 of the first pillar (“Establish and support data systems...”) but there appears to be no focus on collecting data on crash victims beyond the crash circumstances and their immediate treatment. In other words, the victims appear to be relevant to the first pillar (and by implication the second, third and fourth) only insofar as their numbers can be used to develop and evaluate the success of road safety programs and identify target groups and contributing factors.

We argue that information on long term disability can make a significant contribution to road safety management; not just from the point of view of cost, but because insights can be provided into the operation of the overall transport system and the interface between economic, institutional, social and cultural factors that influence the effectiveness of road safety policies and programs.

#### 4 THE SIGNIFICANCE OF LONG TERM DISABILITY

Long term disability is not ignored in public health approaches to road safety, but tends to be allocated a limited role. Debas et al (2006) note that public health approaches exclude what happens after a disease has been contracted or an injury has occurred. Looking at injury in particular, and noting the road traffic crashes account for a substantial proportion of them, Gosselin et al (2009) state that: “There are no definitive data on the number of people who survive with some form of permanent disability for every injury-related death, but estimates run between 10 and 50 times more” (Gosselin et al, 2009:246).

Few studies have been conducted on long term disability after road traffic crashes, with the focus mostly being on short term impacts. For example, Hours et al (2013) report on cohort of French road traffic crash victims, split according to severity and followed up after a year. Even in the less severe category (MAIS <3), 44% reported some functional disability, while two-thirds of those in the higher severity category reported some functional disability. An important issue noted by the authors was that families were affected, not just the individuals themselves, more so in severe (more than half the families) than less severe (22% of families). Similarly, in a study conducted in Nigeria, Juillard et al (2010) found that about one third of people who had been injured in a traffic crash in the previous year reported that it had led to a disability, with two-thirds of these people reporting that the disability left them unable to perform some activities of daily living, some losing their jobs and most suffering some income loss. Juillard et al (2010) acknowledged that they were reporting short term effects and hence under-reported long term disability. They also noted the need for frequent repeated visits to health care providers, a point to which we shall return.

In principle, long term disability is not ignored; the costing of road crashes is undertaken in many jurisdictions around the world as a means of highlighting the significance of road safety and the economic benefits of reducing them, and (depending on the costing method) estimates of long term treatment costs are made. Typically these are based on studies conducted within particular countries (i.e. may not be generalisable) and often rely on estimates due to a lack of good data. For developing countries such data is usually absent, and rough “rules of thumb” are employed. There are some *a priori* reasons to think that developing countries would experience relatively greater costs of long term disability than Western countries. In many developing countries the lack of good trauma care and rehabilitation and the absence of social



support mean that the effects of long term disability are more significant (Gosselin et al, 2009).

The Global Burden of Disease (GBD) project takes another approach, using the concept of disability-adjusted life years (DALYs). A disease or injury which can reduce life expectancy (on average) is the “disability”, and the associated DALYs are estimated by adding up the years of life missed through premature death and an estimate of the years of life which were lived but “lost” though disease, a quality of life measure which assumes that living a certain number of years with a disability is experienced as living a lesser number of years in good health (Arnesen and Nord, 1999). Because they take long term disability into account, DALYs are a potentially useful way of appreciating the burden of long term disability. However, one of the criticisms of the GBD approach has been that the process of arriving at DALYs suffers from a number of questionable assumptions, subjectivity and a lack of reliable data for developing countries (Arnesen and Nord, 1999). Recently Ditsuwan et al (2011) addressed some of these issues by conducting a detailed study in Thailand and comparing the results with earlier GBD estimates. They found that the estimated years lost to disability as a result of non-fatal road traffic injuries was double that of the GBD estimates. They also found that, of the DALYs lost due to non-fatal road traffic injuries, 95% were due to the long term impacts. Using earlier data and the related concept of years lost through disability, Haagsma et al (2012) compared injuries in the Netherlands, Thailand and South Africa. They found that just 1-2% of injuries result in lifelong impairment, but that this accounted for 68-76% of all years lived with a disability. The result from Ditsuwan et al (2011) suggest that (for Thailand at least) the real percentage would be higher.

The disabling impacts of road traffic crashes are significant for development progress as well. Gosselin et al (2009) considered that injuries would interfere with achievement of three of the Millennium Development Goals (MDGs), whereas Ericson and Kim (2011) found evidence in relation to all 8. They undertook a detailed study of 100 households (542 people) randomly sampled from road traffic crashes in a district near Phnom Penh, reaching the following conclusions:

- MDG1 (poverty): 21% income loss for the households overall, greater for the poorest households and where the injury was serious;
- MDG2 (education): drop-out rates were eight times the average for the province;
- MDG3 (gender): income gap became 28% worse, women in the household took up the additional burden of care in 88% of cases;
- MDG4 (child health): there was a 31% deterioration in child health;
- MDG5 (maternal health): there was a 24% deterioration in maternal health;
- MDG6 (priority diseases): rates twice the national average;
- MDG7 (environment): increased wood fuel use, and no improvement in access to water;
- MDG8 (global partnership): none to address the negative welfare impacts of injury.

Clearly, the long term impacts of road traffic crashes are important, and are likely to be greatest in developing countries. While this is enough to justify a greater appreciation of the scale of the impacts of road traffic crashes, we believe that a case can also be made for the relevance of the experience of long term disability to road safety management, i.e. for linking the fifth pillar of the Global Plan to the first.

## 5 LINKING THE FIFTH PILLAR TO THE FIRST: CASE STUDY

Figures 4 and 5 presents schematic representations of information flows that inform the first pillar, road safety management, sourced from King et al (2012). Figure 4 is an approximation of the usual processes, emphasizing the role of the fifth pillar, while Figure 5 suggests a role for the experience of long term disability.

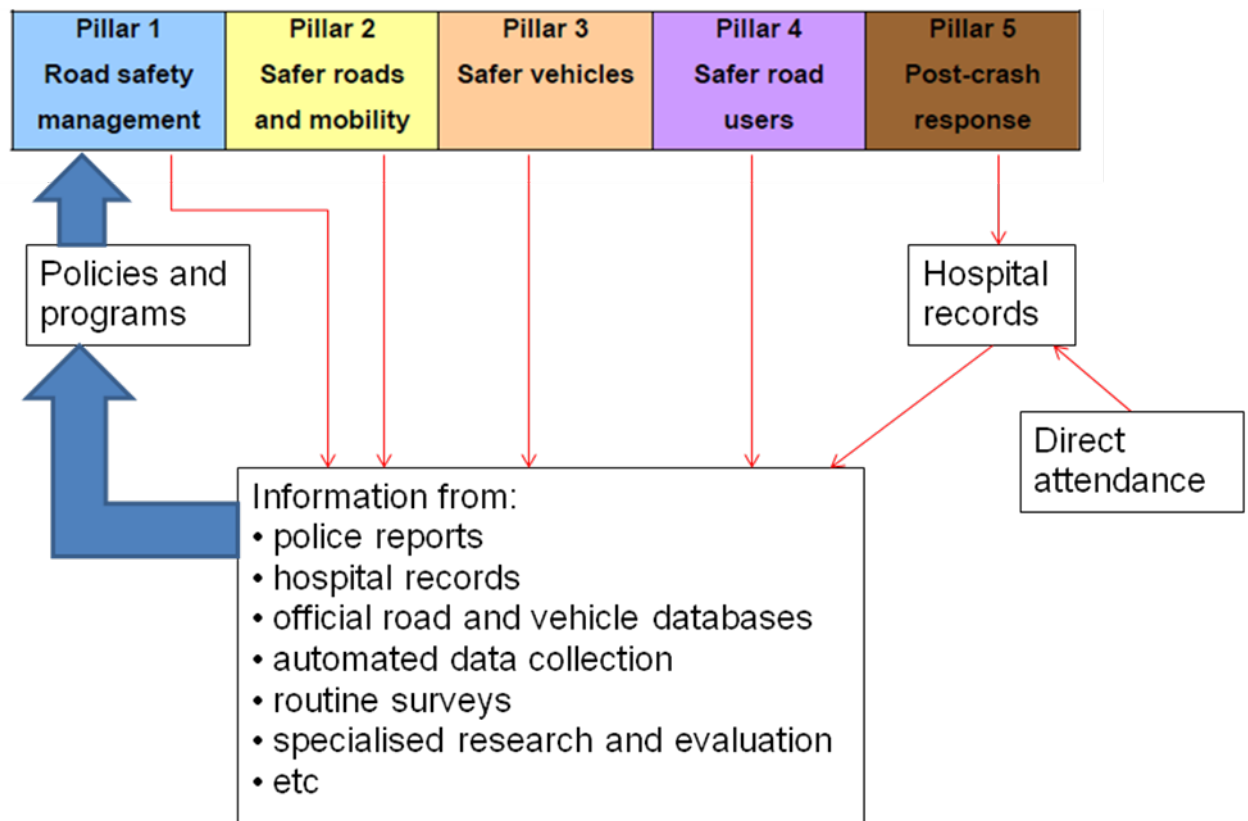


Figure 4: Information flows to inform road safety management (Source: King et al, 2012)

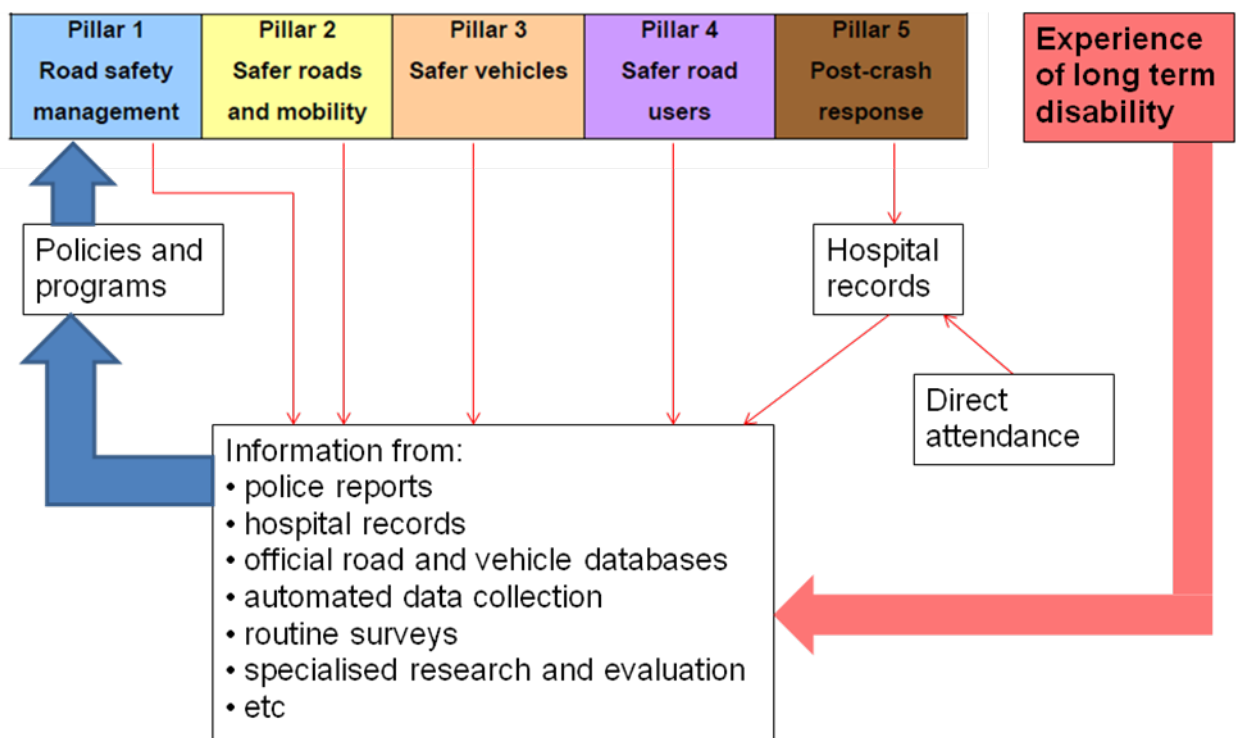


Figure 5: How experience of long term disability can contribute to information flows to inform road safety management (Source: King et al, 2012)



Typically post-crash response to address retrieval and treatment generates hospital data that is considered along with a number of other sources of data. The extent to which the impact of long term disability contributes to this information is quite variable, and often limited.

The first author of this paper (JK) has conducted medical anthropological research into long term disability in Thailand which illustrates how information from the experience of long term disability can contribute to road safety management. Part of this research is reported in King and King (2011).

## 5.1 Description of Thai study

While a range of different types of participant were involved, the main focus was on men with a spinal injury as the results of a road traffic crash, who had previously been a breadwinner for their family. The participants are described below, after an outline of the geographic and demographic setting.

The research was conducted in Northeast Thailand, the poorest region of Thailand, which comprises 20 of the 76 provinces and about one-third of Thailand's population. The second most populous of the Northeastern provinces is Khon Kaen province, with about 1,700,000 people, and Khon Kaen City (population 380,000) is the provincial capital. The research was conducted with the assistance of Khon Kaen University, Khon Kaen Hospital and Srinakirin Hospital, and the cooperation of staff in health centres in the region. Because both rural and urban experiences were of interest, the main participants (men with spinal injury) were drawn from rural areas (Kok Sri, Ban Wha and Ban Haet in Khon Kaen province, and Chang Yun in the neighbouring province of Mahasarakham) and Khon Kaen City.

Qualitative research was conducted by the first author (JK) with the assistance of a translator who had grown up in Khon Kaen. All interviews were taped (with the permission of interviewees) and JK worked with the translator to transcribe the tapes into English. As a starting point, in the process of identifying potential participants, several biomedical informants (four doctors, three nurses, a physical therapist, a healthcare worker and a social worker) were interviewed to provide context, and a focus group of eight people from a semi-rural village was conducted in order to identify local terms for various kinds of disabilities, treatments and associated terms, thus assisting the development of interview guides.

Seven injured men were identified as primary participants and were visited three times at their homes. The first contact involved a brief demographic interview and an introduction to the research and the project, and the second and third contacts were in-depth interviews. At the time of second contact, a primary carer also participated in an in-depth interview. As the research unfolded, the iterative reflexive approach turned up new issues that were followed up. One issue related to medical and transport problems experienced by participants, and was followed up through in-depth interviews with two nurses from primary care units that serviced some of the injured participants. The interviews with the injured men and their carers also highlighted the importance of Thai Buddhist concepts, earlier animist beliefs common in Northeast Thailand, and the practices of a diverse range of traditional Thai healers. A traditional healer and a Buddhist monk were interviewed about these issues, and earlier information from some biomedical informants was followed up by revisiting them.

Structured observations were undertaken at two hospital rehabilitation units, one occupational unit, on a half-day visit with a community care nurse, at a meeting of the 'Wheelchair Team' at Srinakirin Hospital (men and women in wheelchairs) and at the homes of the injured participants.

Due to constraints on the time (three months) and resources available for the research, and the desire to gain rich qualitative data, the small number of primary participants was inevitable. However, the research ultimately involved 42 interviews with 28 different people,

plus a focus group and 26 sets of observations, thereby yielding a substantial volume of transcribed information and descriptions.

There were a number of themes that emerged from the research, falling under broad headings of social and cultural construction of risk, the way the household coped with disability, and a range of issues related to health and support services. We will return to some of the findings under these themes later, however we will first outline some of the results relevant to the transport context

## 5.2 Results: Transport costs/services and road environment

The findings directly relevant to transport and road safety fell into two main categories.

*Contrast in transport costs:* As with most countries where levels of motorization are still relatively low, the local transport options are generally buses or converted utilities (pickups) that relay on high volumes of passengers since the fares are low. At the time, a standard fare was 10Bt in Khon Kaen, which was only \$US0.25 (although to put it in context, a labourer earned only 100Bt per day, or \$US2.50). However, men with quadriplegia or paraplegia cannot use these forms of transport as ordinary passengers, but have to hire the whole vehicle for an extended period, for a cost of 1,000Bt, i.e. about 10 full days' pay for a labourer. The same fee applied in a case where the village had a communal vehicle. It is clearly impossible for many of these trips to be made in a year, so that many people with long term disability simply stop attending health services and eventually disappear from their records. This points to an inadequacy of the transport system which is relevant to road safety management at a broad level.

*Unfriendly road environment:* Charitable organizations have been supporting developing countries in various ways, including the supply of used wheelchairs for people with disabilities, and several of the participants had them. However in most cases these were of very little use. Traditional Thai houses are raised, with a space underneath, and in many cases the surface is bare ground which is prone to rutting and saturation. Even when the space under house is paved or enclosed, the area around is not. Adjoining roads often do not have footpaths, and if they do the surface is often uneven, broken or obstructed. There is a tendency at the policy level to neglect footpaths in favour of road construction, and to deal with road crossing needs by building overbridges which are completely inaccessible to people with disabilities.

## 5.3 Results: Social and cultural factors

As noted earlier, there was a range of findings that related to the experience of disability that are not directly relevant to this paper; many are covered in King and King (2011). However the following themes are relevant here.

*Attribution of crashes to kam (karma):* The interpretation of Buddhism shared by almost all non-biomedical participants (the men, their families, villagers, etc.) and some of the biomedical informants meant that severely injured victims of road crashes were at fault by definition: the scale of their injury meant that they must have done something very bad in a previous life. This means that road safety messages about safe road use behaviours were not given much credibility, since there was a sense of predetermination. Since some people had crashes while doing the right thing, and most people had experiences of travelling without incident while doing the wrong thing, their experience was consistent with this form of attribution.

*Lack of connection between ordinary people and experts:* The research included interviews with injury experts (especially doctors) who knew about local beliefs relating to kam (karma) as well as other animistic beliefs, but were certain that such beliefs were only found among older people, not young Thais. The research found the opposite, that such beliefs were a

common way of understanding road crashes and incidents of everyday life. This suggests that the understanding of Thai road user motivations and attitudes among experts is likely to be out of touch with the beliefs shared by ordinary Thais.

#### 5.4 Implications for road safety management

Even though the Thai study is small and qualitative, there are implications that can inform road safety management.

First, the transport environment has shortcomings in accessibility that need to be addressed. It is acknowledged that the number of people with spinal injury in Thailand is not large, however there would be many other people with mobility restrictions (especially as the population ages) who would benefit from more accessible and affordable transport alternatives. As an aside it is worth noting at present the injunction under the fifth pillar activities for employers to recruit and retain disabled workers cannot be translated into practice if the transport system does not enable them to travel to work, either at all or at a feasible cost.

Second, the accessibility and safety of built environment for non-motorised road users needs to be addressed. In this case the problems experienced by the participants (unpaved roads, lack of footpaths, broken and blocked footpaths) are shared by all pedestrians. While they are directly relevant to accessibility, their safety implications are also clear: pedestrians are forced to walk on the road, and the lack of convenient crossings encourages illegal and unsafe crossings. Addressing the needs of people with disability in this way is an example of the “iceberg principle”, where road safety measures introduced to meet the needs of a relatively small group with special needs can have knock-on effects that benefit a much wider range of road users (King, 2000). While this is nominally covered by Pillar 2 (Safer roads and mobility), the leadership involved in shifting the focus towards people with disability is a key role of the first pillar.

Third, the credibility of messages about road safety, in particular the behaviours which will contribute to safer road use, is challenged by culturally-based attributions. This needs to be acknowledged and addressed.

Fourth, the lack of concordance between the attitudes and motivations of ordinary Thais and experts indicates a need for decision makers and program developers to be informed by sound research that gives them a better understanding.

### 6 DISCUSSION

The case study above provides an illustration of how information from long term disability, essentially part of the fifth pillar in the Global Plan, can better inform the first pillar of road safety management. It is worth noting that the Thai research was not designed for this purpose: it was designed as an exploration of the lived experience of disability in a cultural context. The fact that it still provides useful insights to transport and road safety management implies that more focused research into the long term impacts of road crashes can contribute even more useful information.

One of the benefits of the research reported in the case study was a better understanding of social and cultural influences. Another example of the importance of these influences for road safety management can be found in the work of Kayani et al (2012a, 2012b) in Pakistan, in which one of us (MK) is involved. In this research, the attribution of crashes to fate in Pakistan, combined with local interpretations of religion, contributes to the under-reporting of road crashes and the avoidance of the allocation of fault to road users involved in the crash. This directly affects road safety management, which relies on the collection of comprehensive and reliable crash data. While the Pakistan study is only indirectly about post-crash impacts,

it illustrates that the kind of insight gained in the Thai study about the effects of cultural and social factors on road safety management is unlikely to be restricted to Thailand.

In addition, the mobility constraints experienced by people with long term disability can point to systemic issues that might otherwise go unnoticed, for example low numbers of health service attendances by long term disabled crash victims may be interpreted as being due to good community care or recovery, but may in fact reflect an expensive and inadequate transport system that they have given up using.

A better understanding of the lived experience of long term disability from traffic crashes therefore has the potential to provide a feedback loop from the fifth pillar to the first, as well as informing the other three. In terms of the years of life spent with a disability as the result of a road crash, people with a long term disability, though relatively few in number, account for a large majority of this experience. Addressing the issues that they have with the transport system and road safety management will also provide benefits to a much wider range of road users.

The main shortcoming of this paper is that it is based on limited research but makes a large claim for the importance of linking the fifth pillar to the first. This shortcoming amounts to a call for further exploration of the application of research on long term impacts of road crashes to road safety management, in particular the non-economic impacts. A further and more specific shortcoming is that this paper has not quantified the potential benefit of feeding back information about long term disability into road safety management. Along these lines, the approach taken by Debas et al (2006) to the estimation of DALYs that could be saved through post-event surgical interventions could provide some further insights.

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